AMENDMENTS TO THE CLAIMS

1. (Currently Amended) A data transmission method for a transmission apparatus for[[of]] transmitting a plurality of data sequences from a plurality of transmission antennas to a plurality of reception antennas using MIMO-OFDM, the method comprising:

dividing a synchronization symbol in which predetermined amplitudes and phases are assigned to a plurality of subcarriers which are spaced at predetermined frequency intervals and are orthogonal to each other, into the plurality of transmission antennas, to generate a plurality of synchronization subsymbols;

modulating a plurality of pieces of transmission data to be transmitted from the plurality of transmission antennas into a plurality of data symbol sequences;

generating propagation coefficient estimation symbols, that are orthogonal to each other, between each of the transmission antennas as symbols for estimating inverse functions of propagation coefficients possessed by a plurality of transfer paths~~path~~ between the transmission antennas and the reception antennas;

multiplexing the data symbol sequences, the synchronization subsymbols, and the propagation coefficient estimation symbols into a transfer frame for each of the plurality of transmission antennas; and

converting the transfer frames multiplexed for the plurality of transmission antennas into radio signals; and

simultaneously transmitting the radio signals from the plurality of transmission antennas[[.]],

wherein, in said simultaneously transmitting, a plurality of different transmission local oscillators are used for the plurality of transmission antennas, respectively.

2. (Cancelled)

3. (Currently Amended) The data transmission method according to claim 1, wherein said~~the~~ modulating into the data symbol sequence comprises:

generating a data carrier by applying an amplitude and a phase based on the transmission data to a predetermined one of the plurality of subcarriers;

generating a pilot carrier by assigning a known phase and amplitude to a subcarrier other

than the data carrier; and

orthogonally multiplexing the data carrier and the pilot carrier into a plurality of data symbols, and outputting the plurality of orthogonally multiplexed data symbols as the data symbol sequence.

4. (Previously Presented) The data transmission method according to claim 3, wherein said generating of the pilot carrier comprises assigning a known phase and amplitude as the pilot carrier to only one of data symbols to be simultaneously transmitted from the plurality of transmission antennas, and assigning an amplitude of 0 as the pilot carrier to the other data symbols to be simultaneously transmitted.

5. (Cancelled)

6. (Currently Amended) A data reception method for a reception apparatus for[[of]] receiving a plurality of data sequences transmitted from a plurality of transmission antennas using MIMO-OFDM, via a plurality of reception antennas, wherein

the plurality of data sequences include synchronization subsymbols generated by dividing a synchronization symbol composed of a plurality of subcarriers orthogonal to each other into the plurality of transmission antennas,

the method comprising:

receiving the plurality of data sequences for each of the reception antennas;

synchronizing and demodulating the data sequences received by the plurality of reception antennas for each of the reception antennas; and

estimating characteristics possessed by a plurality of transfer paths between the transmission antennas and the reception antennas, for each of the transfer paths, based on a received signal demodulated for each of the reception antennas and the synchronization subsymbols included in the received signal[[.]],

wherein, in said synchronizing and demodulating, a plurality of different reception local oscillators are used for the plurality of reception antennas, respectively.

7. (Previously Presented) The data reception method according to claim 6, wherein said

estimating of the characteristics for each of the transfer paths comprises estimating a frequency error occurring in each of the transfer paths from a correlation between the received signal demodulated for each of the reception antennas and the synchronization subsymbol included in the received signal, and

the data reception method further comprises, after said estimating of the characteristics for each of the transfer paths, correcting a frequency of the received signal based on the estimated frequency error.

8. (Previously Presented) The data reception method according to claim 7, wherein said correcting of the frequency of the received signal comprises:

calculating a frequency correction value for correcting the received signal, for each of the reception antennas, by weighted-averaging the estimated frequency error occurring in each of the transfer paths; and

correcting the frequency of the received signal based on the calculated frequency correction value for each of the reception antennas, and outputting the received signal having the corrected frequency.

9. (Previously Presented) The data reception method according to claim 7, wherein said estimating of the frequency error comprises generating a received symbol timing based on a weighted average of peak timings of correlation values between the received signal and the synchronization subsymbol included in the received signal.

10. (Previously Presented) The data reception method according to claim 7, wherein the received signal comprises propagation coefficient estimation symbols orthogonal to each other between each of the transmission antennas as symbols for estimating inverse functions of propagation coefficients possessed by the plurality of transfer paths between the transmission antennas and the reception antennas, and

the data reception method further comprises, after said correcting of the frequency of the received signal, estimating the inverse function of the propagation coefficient for each of the plurality of transfer paths based on the propagation coefficient estimation symbol included in the received signal having the corrected frequency, and based on the estimated inverse function,

separating signals transmitted from the plurality of transmission antennas from the plurality of received signals.

11. (Previously Presented) The data reception method according to claim 6, further comprising, between said synchronizing, said demodulating, and said calculating of the characteristics for each of the transfer paths,

estimating a frequency error included in the demodulated received signal for each of the reception antennas, based on a correlation between the received signal demodulated by the synchronizing and demodulating step for each of the reception antennas, and the synchronization symbol synthesized from the synchronization subsymbol included in the received signal;

calculating an average frequency error with respect to the plurality of received signals by weighted-averaging the estimated frequency errors; and

a second correcting of the frequencies of the plurality of received signals based on the calculated average frequency correction value.

12. (Currently Amended) The data reception method according to claim 6, wherein said~~the~~ receiving comprises:

receiving the signals transmitted from the plurality of transmission antennas using reception antennas the number of which is larger than the number of the plurality of data sequences;

determining reception levels of the signals received by the larger number of reception antennas; and

selecting or combining the signals received by the larger number of reception antennas, depending on the determined reception levels.

13. (Cancelled)

14. (Previously Presented) The data reception method according to claim 6, wherein said estimating of the characteristics for each of the transfer paths comprises estimating rough frequency characteristics for each of the transfer paths by interpolation of phases and amplitudes of the plurality of subcarriers included in the received signal, based on the synchronization

subsymbol included in the received signal demodulated for each of the reception antennas, and

the method further comprises, after said estimating of the characteristics for each of the transfer paths, estimating inverse functions of propagation coefficients possessed by the plurality of transfer paths based on the estimated rough frequency characteristics of each of the transfer paths, and separating signals transmitted by the plurality of transmission antennas from the plurality of received signal based on the estimated inverse functions.

15. (Currently Amended) A data transmission apparatus for[[of]] transmitting a plurality of data sequences from a plurality of transmission antennas to a plurality of reception antennas using MIMO-OFDM, the apparatus comprising:

a plurality of synchronization subsymbol generating sections for[[of]] dividing a synchronization symbol in which predetermined amplitudes and phases are assigned to a plurality of subcarriers spaced at predetermined frequency intervals, into the plurality of transmission antennas, to generate a plurality of synchronization subsymbols which are orthogonal to each other between each of the plurality of transmission antennas;

~~a plurality of modulation sections of modulating the plurality of synchronization subsymbols for the respective transmission antennas;~~

a plurality of data modulation sections for modulating a plurality of pieces of transmission data to be transmitted from the plurality of transmission antennas into a plurality of data symbol sequences;

a plurality of propagation coefficient estimation symbol generation sections for generating propagation coefficient estimation symbols which are orthogonal to each other between each of the transmission antennas as symbols for estimating inverse functions of propagation coefficients possessed by a plurality of transfer paths between the transmission antennas and the reception antennas;

a plurality of multiplexing sections for multiplexing the data symbol sequences, the synchronization subsymbols, and the propogation coefficient estimation symbols into transfer frames for the plurality of transmission antennas; ~~and~~

a plurality of conversion sections~~section~~ for converting the transfer frames multiplexed for the plurality of transmission antennas into radio signals~~, wherein~~; and

a plurality of different transmission local oscillators for transmitting the radio signals, the

plurality of different transmission local oscillators being provided for the plurality of transmission antennas, respectively,

wherein the plurality of transmission antennas simultaneously transmit signals modulated by the plurality of ~~modulation~~ conversion sections.

16. (Currently Amended) A reception apparatus for[[of]] receiving a plurality of data sequences transmitted from a plurality of transmission antennas using MIMO-OFDM, via a plurality of reception antennas, wherein

the plurality of data sequences include synchronization subsymbols generated by dividing a synchronization symbol composed of a plurality of subcarriers orthogonal to each other for each of the plurality of transmission antennas,

the apparatus comprising:

a plurality of reception antennas for[[of]] receiving the plurality of data sequences;

a plurality of demodulation sections of synchronizing and demodulating the data sequences received by the plurality of reception antennas for each of the reception antennas;

a plurality of synchronization subsymbol correlation sections of estimating a frequency error included in a received signal demodulated for each of the reception antennas~~antenna~~ from a correlation between the received signal and the synchronization subsymbol included in the received signal, for each transfer path; ~~and~~

a plurality of frequency correcting sections of correcting a frequency of the received signal based on the estimated frequency error for each of the plurality of reception antennas; and

a plurality of different reception local oscillators for receiving the data sequences, the plurality of different reception local oscillators being provided for the plurality of reception antennas, respectively.

17. (New) A data transmission method for a transmission apparatus for transmitting a plurality of data sequences from a plurality of transmission antennas to a plurality of reception antennas using MIMO-OFDM, the method comprising:

dividing a synchronization symbol in which predetermined amplitudes and phases are

assigned to a plurality of subcarriers which are spaced at predetermined frequency intervals and are orthogonal to each other, into the plurality of transmission antennas, to generate a plurality of synchronization subsymbols;

modulating a plurality of pieces of transmission data to be transmitted from the plurality of transmission antennas into a plurality of data symbol sequences;

generating propagation coefficient estimation symbols, that are orthogonal to each other, between each of the transmission antennas as symbols for estimating inverse functions of propagation coefficients possessed by a plurality of transfer paths between the transmission antennas and the reception antennas;

multiplexing the data symbol sequences, the synchronization subsymbols, and the propagation coefficient estimation symbols into a transfer frame for each of the plurality of transmission antennas; and

converting the transfer frames multiplexed for the plurality of transmission antennas into radio signals; and

simultaneously transmitting the radio signals from the plurality of transmission antennas,

wherein in said simultaneously transmitting, a plurality of different transmission local oscillators are used for the plurality of transmission antennas, respectively, to simultaneously transmit the radio signals to the plurality of reception antennas for which a single reception local oscillator is used in common.

18. (New) A data transmission method for a transmission apparatus for transmitting a plurality of data sequences from a plurality of transmission antennas to a plurality of reception antennas using MIMO-OFDM, the method comprising:

dividing a synchronization symbol in which predetermined amplitudes and phases are assigned to a plurality of subcarriers which are spaced at predetermined frequency intervals and are orthogonal to each other, into the plurality of transmission antennas, to generate a plurality of synchronization subsymbols;

modulating a plurality of pieces of transmission data to be transmitted from the plurality of transmission antennas into a plurality of data symbol sequences;

generating propagation coefficient estimation symbols, that are orthogonal to each other, between each of the transmission antennas as symbols for estimating inverse functions of

propagation coefficients possessed by a plurality of transfer paths between the transmission antennas and the reception antennas;

multiplexing the data symbol sequences, the synchronization subsymbols, and the propagation coefficient estimation symbols into a transfer frame for each of the plurality of transmission antennas;

converting the transfer frames multiplexed for the plurality of transmission antennas into radio signals; and

simultaneously transmitting the radio signals from the plurality of transmission antennas,

wherein in said simultaneously transmitting, a single transmission local oscillator common to the plurality of transmission antennas is used to simultaneously transmit the radio signals to the plurality of reception antennas for which a plurality of different reception local oscillators are used, respectively.

19. (New) A data reception method for a reception apparatus for receiving a plurality of data sequences transmitted from a plurality of transmission antennas using MIMO-OFDM, via a plurality of reception antennas, wherein

the plurality of data sequences include synchronization subsymbols generated by dividing a synchronization symbol composed of a plurality of subcarriers orthogonal to each other into the plurality of transmission antennas,

the method comprising:

receiving the plurality of data sequences for each of the reception antennas;

synchronizing and demodulating the data sequences received by the plurality of reception antennas for each of the reception antennas; and

estimating characteristics possessed by a plurality of transfer paths between the transmission antennas and the reception antennas, for each of the transfer paths, based on a received signal demodulated for each of the reception antennas and the synchronization subsymbols included in the received signal,

wherein in said synchronizing and demodulating, a single reception local oscillator common to the plurality of reception antennas is used to demodulate the data sequences that are transmitted, from the plurality of transmission antennas, by using a plurality of different transmission local oscillators for the plurality of transmission antennas, respectively.

20. (New) A data reception method for a reception apparatus for receiving a plurality of data sequences transmitted from a plurality of transmission antennas using MIMO-OFDM, via a plurality of reception antennas, wherein

the plurality of data sequences include synchronization subsymbols generated by dividing a synchronization symbol composed of a plurality of subcarriers orthogonal to each other into the plurality of transmission antennas,

the method comprising:

receiving the plurality of data sequences for each of the reception antennas;

synchronizing and demodulating the data sequences received by the plurality of reception antennas for each of the reception antennas; and

estimating characteristics possessed by a plurality of transfer paths between the transmission antennas and the reception antennas, for each of the transfer paths, based on a received signal demodulated for each of the reception antennas and the synchronization subsymbols included in the received signal,

wherein in said synchronizing and demodulating, a plurality of different reception local oscillators are used for the plurality of reception antennas, respectively, to demodulate the data sequences that are transmitted from the plurality of transmission antennas for which a single transmission local oscillator is used in common.